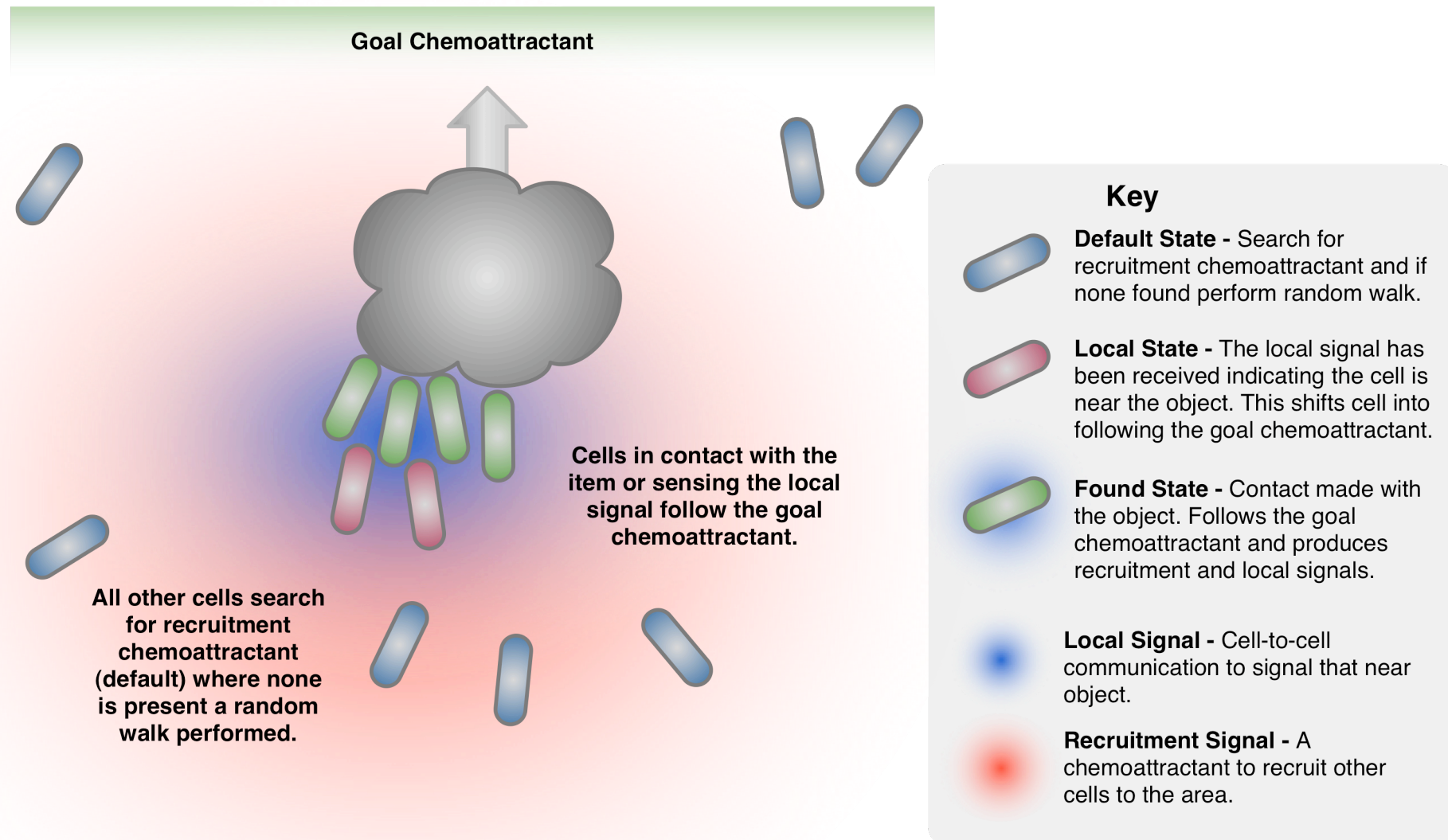


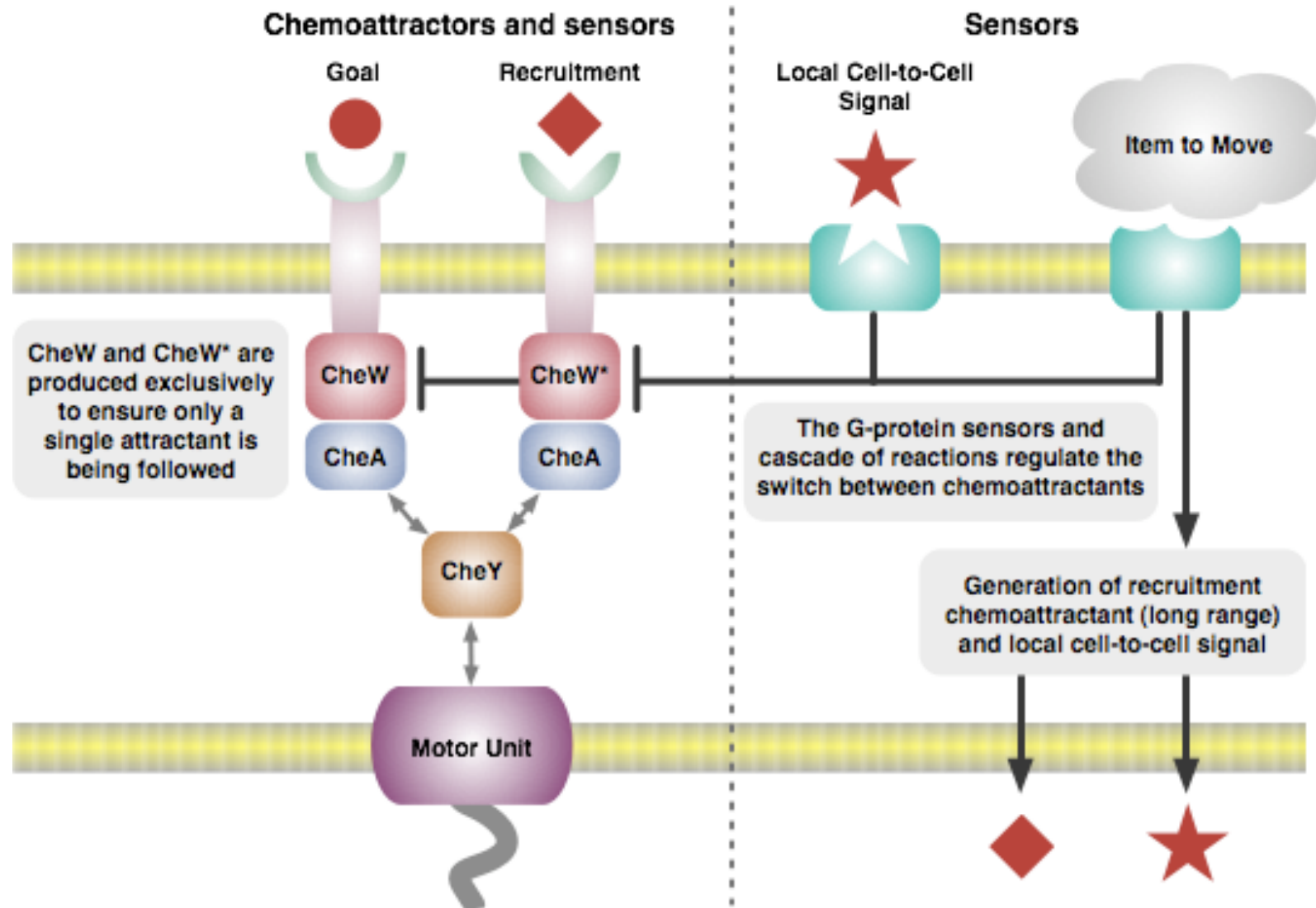
Previous iGEM Chemotaxis Projects

- **Remote Controlled Bacteria – University California San Francisco 2006**
 - Switchable chemoattractant (*E.coli* contains five different receptors)
 - Alter the signaling pathways
 - Orthogonal interactions designed and CheW and CheW mutant created
 - By switching the expression of CheW/CheW mutant different receptors enable
- **Pattern Formation Using Mobility – Cambridge 2006**
 - Free swimming bacteria
 - Bi-directional communication with quorum sensing
 - Green and Red populations (GFP, RFP)
 - Battle occurs when sufficient numbers, losers defect
- **Seek and Destroy *E.coli* – Rice 2006**
 - Link quorum sensing with chemotaxis
 - Move towards *B.subtilis* pheromone
 - Signal goal reached with GFP or gram-positive lethal proteins
- **X-Y Chemotaxis – Bangalore 2006**
 - 2D Control of movement using 3 different chemoattractors
 - Problems with chemoreceptors interfering with each other

Co-operative Movement Overview



Possible Implementation



Chemotaxis or Thermotaxis

- Switchable Chemoattractant
 - Use previous work by University California San Francisco (2006) *“Remote controlled bacteria”*
 - Existing parts for orthogonal CheW/CheW* and full sensors:
 - **BBa_J56004**: Tar, aspartate receptor mutated to bind with BBa_J56001
 - **BBa_J56007**: PheTar, phenylalanine receptor mutated to respond to phenylalanine
 - **BBa_J56001**: CheW_mut, mutated to bind with orthogonal partner BBa_J56004
 - **BBa_J56018**: CheW, wild-type CheW
 - No information on the success of the parts
- Alternatively, Thermotaxis?
 - Only allows for single gradient to be followed
 - Easier to maintain temperature gradient during experiments
 - Would result in new bio-brick
 - Use w.t. Tsr and Tar.
 - Pathway also results in cooperative behavior through production of glycine.

Particle Sensors

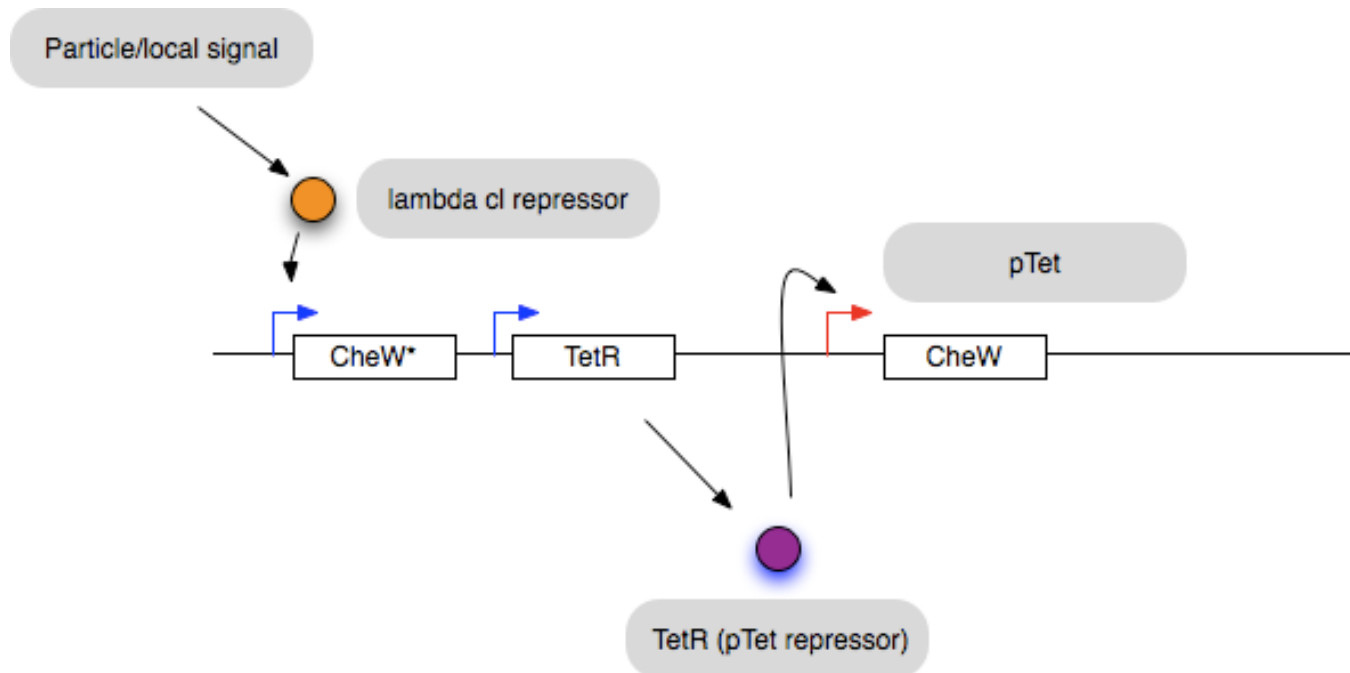
- Latex particles may be suitable
 - Come in various sizes
 - Coat with substance required for sensor
- Fluorescent particle
 - Use an existing light sensor bio-brick
 - **BBa_I15008, BBa_I15009, BBa_I15010, BBa_R0082**
 - Need to test that fluorescent particle has strength to trigger sensor
- Iron coated particle
 - Fen signaling pathway (Harvard 2007)
 - Iron promoter
 - Requires iron to diffuse into cell
 - Will need to alter an existing part to remove the iron promoter
 - **BBa_I765013**: Iron promoter- luxI HSL signaling device

Other Sensors

- Recruitment
 - Chemoreceptors for recruitment signal
- Once close to particle switch to goal chemoattractant
 - Bacteria in contact with particle send out local cell-to-cell signal
 - Use quorum sensing to evaluate how close
 - Bio-bricks exist that use Lux based system and 3OC₆HSL signaling molecule.
 - **BBa_F1610**: 3OC₆HSL Sender Device
 - **BBa_F2621**: 3OC₆HSL Receiver Device

Control

- Switchable Chemoattractant
 - **BBa_C0051**: Lambda cl repressor
 - **BBa_R0051**: pR
 - **BBa_C0040**: TetR
 - **BBa_R0040**: pTet



Options

- Switchable chemotaxis with recruitment
- Thermotaxis - possibly incorporates quorum sensing
- Chemotaxis lacking recruitment



illustration: Don Smith